

WHAT IS CLAIMED IS:

1. A method for testing a plurality of micro-magnetic switches formed on a wafer, wherein each switch includes a cantilever and a coil, comprising:

(A) positioning a magnet adjacent to a cantilever of a first switch located on the wafer, wherein the magnet induces a magnetization in a magnetic material of the cantilever;

(B) contacting a first set of probes with contact areas of the coil;

(C) contacting a second set of probes with conductors for signals associated with the cantilever;

(D) determining with the second set of probes whether the cantilever is in a first state;

(E) causing a current to flow through the coil with the first set of probes to switch the cantilever from the first state to a second state; and

(F) after step (E), determining with the second set of probes whether the cantilever is in the second state.

2. The method of claim 1, further comprising:

(G) providing an indication that the first switch has failed when the cantilever is determined to not be in the first state during step (D) and/or is determined to not be in the second state during step (F).

3. The method of claim 2, wherein step (G) comprises:

inking a region of the wafer where the first switch is located.

4. The method of claim 1, wherein step (A) comprises:

optically positioning the magnet.

5. The method of claim 4, wherein said optically positioning step comprises:

viewing the cantilever through an opening in the magnet; and

positioning the magnet in accordance with the view of the cantilever through the opening.

6. The method of claim 1, wherein step (A) comprises:
mechanically positioning the magnet.
7. The method of claim 1, wherein step (B) comprises:
electrically coupling a first probe of the first set of probes to a first end of the coil; and
electrically coupling a second probe of the first set of probes to a second end of the coil. √
8. The method of claim 1, wherein the conductors associated with the cantilever include a first conductor and a second conductor, wherein in the first state, the cantilever electrically couples the first conductor to the second conductor, wherein step (C) comprises:
electrically coupling a first probe of the second set of probes to the first conductor; and
electrically coupling a second probe of the second set of probes to the second conductor.
9. The method of claim 8, wherein step (D) comprises:
determining whether the first conductor is electrically coupled to the second conductor.
10. The method of claim 9, wherein in the second state, the cantilever does not electrically couple the first conductor to the second conductor, wherein step (F) comprises:
determining whether the first conductor is not electrically coupled to the second conductor.

11. The method of claim 8, wherein the conductors associated with the cantilever further include a third conductor and a fourth conductor, wherein in the second state, the cantilever electrically couples the third conductor to the fourth conductor, wherein step (C) comprises:

electrically coupling a third probe of the second set of probes with the third conductor; and

electrically coupling a fourth probe of the second set of probes with the fourth conductor.

12. The method of claim 11, wherein step (F) comprises:

determining whether the third conductor is electrically coupled to the fourth conductor.

13. The method of claim 12, wherein in the first state, the cantilever does not electrically couple the third conductor to the fourth conductor, wherein step (D) comprises:

determining whether the third conductor is not electrically coupled to the fourth conductor.

14. The method of claim 8, wherein steps (D) and (F) each comprise:

measuring a resistance between the first probe and the second probe.

15. The method of claim 8, wherein steps (D) and (F) each comprise:

passing a second current from the first probe to the second probe; and
measuring a voltage difference between the first probe and the second probe.

16. The method of claim 11, wherein steps (D) and (F) each comprise:

measuring a resistance between the third probe and the fourth probe.

17. The method of claim 11, wherein steps (D) and (F) each comprise:

passing a second current from the third probe to the fourth probe; and measuring a voltage difference between the third probe and the fourth probe.

18. The method of claim 1, wherein the first set of probes and the second set of probes are held by a probe card, further comprising:

(G) prior to steps (B) and (C), positioning the probe card adjacent to the first switch.

19. The method of claim 2, further comprising:

(H) moving the wafer so that the magnet is positioned adjacent to a cantilever of another switch located on the wafer, wherein the magnet induces a magnetization in a magnetic material of the cantilever of the another switch.

20. The method of claim 19, further comprising:

(I) repeating steps (B)-(G) for the another switch.

21. The method of claim 20, further comprising:

(J) repeating steps (H) and (I) for each switch of a plurality of switches on the wafer.

22. A system for testing a plurality of micro-magnetic switches formed on a wafer, wherein each switch includes a cantilever and a coil, comprising:

magnetic means positioned adjacent to a cantilever of a first switch on the wafer;

first interfacing means for interfacing with contact areas of a coil associated with the cantilever;

second interfacing means for interfacing with conductors associated with the cantilever on the wafer;

means for conducting a current through the coil with the first interfacing means to switch the cantilever from a first state to a second state; and

means for determining whether the cantilever is in the first state prior to conducting the current through the coil, and whether the cantilever is in the second state after conducting the current through the coil, wherein said means for determining is coupled to said second interfacing means.

23. The system of claim 22, further comprising:

means for providing an indication that the first switch has failed when the cantilever is determined to not be in the first state prior to conducting the current through the coil or is determined to not be in the second state after conducting the current through the coil by the means for determining.

24. The system of claim 23, wherein said means for providing an indication comprises:

means for inking a region of the wafer where the switch is located.

25. The system of claim 22, further comprising:

means for positioning said magnetic means to be adjacent to the cantilever of the first switch located on the wafer.

26. The system of claim 25, wherein said means for positioning comprises:

means for optically positioning said magnetic means to be adjacent to the cantilever.

27. The system of claim 26, wherein said magnetic means includes a magnet having a centrally located opening therethrough, wherein said means for optically positioning said magnetic means comprises:

means for viewing the cantilever through said opening in said magnet.

28. The system of claim 25, wherein said means for positioning comprises:
means for mechanically positioning said magnetic means to be adjacent to the cantilever.

29. The system of claim 22, wherein said first interfacing means comprises:

a first probe that electrically couples with a first end of the coil; and
a second probe that electrically couples with a second end of the coil.

30. The system of claim 22, wherein the conductors associated with the cantilever include a first conductor and a second conductor, wherein in the first state, the cantilever electrically couples the first conductor to the second conductor, wherein said second interfacing means comprises:

a first probe that electrically couples with the first conductor; and
a second probe that electrically couples with the second conductor.

31. The system of claim 30, wherein said means for determining comprises:

means for determining whether the first conductor is electrically coupled to the second conductor.

32. The system of claim 31, wherein in the second state, the cantilever does not electrically couple the first conductor to the second conductor, wherein said means for determining whether the first conductor is electrically coupled to the second conductor comprises:

means for determining whether the first conductor is not electrically coupled to the second conductor.

33. The system of claim 22, wherein the conductors associated with the cantilever further include a third conductor and a fourth conductor, wherein in

the second state, the cantilever electrically couples the third conductor to the fourth conductor, wherein said second interfacing means comprises:

- a third probe that electrically couples with the third conductor; and
- a fourth probe that electrically couples with the fourth conductor.

34. The system of claim 33, wherein said means for determining comprises:

means for determining whether the third conductor is electrically coupled to the fourth conductor.

35. The system of claim 34, wherein in the first state, the cantilever does not electrically couple the third conductor to the fourth conductor, wherein said means for determining whether the third conductor is electrically coupled to the fourth conductor comprises:

means for determining whether the third conductor is not electrically coupled to the fourth conductor.

36. The system of claim 30, wherein said means for determining comprises:

means for measuring a resistance between the first probe and the second probe.

37. The system of claim 30, wherein said means for determining comprises:

means for passing a second current from the first probe to the second probe; and

means for measuring a voltage drop between the first probe and the second probe.

38. The system of claim 33, wherein said means for determining comprises:

means for measuring a resistance between the third probe and the fourth probe.

39. The system of claim 33, wherein said means for determining comprises:

means for passing a second current from the third probe to the fourth probe; and

means for measuring a voltage drop between the third probe and the fourth probe.

40. The system of claim 22, further comprising:

a probe card that mounts said first interfacing means and said second interfacing means.

41. The system of claim 23, further comprising:

means for step-wise moving the wafer so that said magnetic means is positioned adjacent to a cantilever of each switch of a plurality of switches located on the wafer;

wherein said means for step-wise moving the wafer interfaces said first interfacing means with contact areas of a coil associated with the cantilever of each switch of the plurality of switches; and

wherein said means for step-wise moving the wafer interfaces said second interfacing means with conductors associated with the cantilever of each switch of the plurality of switches.

42. The system of claim 22, further comprising:

at least one additional magnetic means held in a fixed position relative to said first magnetic means, wherein said at least one additional magnetic means is positioned adjacent at least one additional switch of the plurality of switches.

43. The system of claim 42, further comprising:

- at least one additional first interfacing means for interfacing with contact areas of at least one additional coil associated with the at least one additional switch; and

- at least one additional second interfacing means for interfacing with conductors on the wafer for signals associated with at least one additional cantilever of the at least one additional switch.

44. A system for testing a plurality of micro-magnetic switches formed on a wafer, wherein each switch of the plurality of switches includes a cantilever and a coil, comprising:

- a wafer chuck that holds a wafer;

- at least one stepper motor that moves said wafer chuck to move the wafer;

- a magnet proximate to the wafer that is positioned adjacent to a first switch of the plurality of switches;

- a probe card proximate to the wafer that is positioned adjacent to the first switch, wherein the probe card mounts

- a first set of probes that interface with contact areas of a coil associated with the first switch, and

- a second set of probes that interface with conductors on the wafer associated with the cantilever of the first switch;

- a current source electrically coupled to the first set of probes, wherein the current source activates the coil of the first switch using the first set of probes to switch the cantilever from a first state to a second state;

- a source monitor unit electrically coupled to the second set of probes, wherein the source monitor unit determines whether the cantilever of the first switch is in the first state prior to the current source activating the coil of the first switch, and determines whether the cantilever is in the second state after the current source activates the coil of the first switch.

45. The system of claim 44, wherein said at least one stepper motor moves said wafer in a direction substantially perpendicular to a plane of said wafer to interface said first set of probes with the contact areas of the coil of the first switch, and to interface said second set of probes with the conductors on the wafer associated with the cantilever of the first switch;

wherein said magnet induces a magnetization in a magnetic material of the cantilever of the first switch.

46. The system of claim 45, wherein said at least one stepper motor moves said wafer in a second direction substantially perpendicular to the plane of said wafer to de-interface said first set of probes from the contact areas of the coil of the first switch, and to de-interface said second set of probes from the conductors associated with the cantilever of the first switch.

47. The system of claim 46, wherein said at least one stepper motor moves said wafer in the plane of said wafer such that said magnet and said probe card are positioned adjacent to a cantilever of a second switch on the wafer.

48. The system of claim 47, wherein said at least one stepper motor moves said wafer in the first direction substantially perpendicular to the plane of said wafer to interface said first set of probes with contact areas of a coil of the second switch, and to interface said second set of probes with conductors on the wafer associated with the cantilever of the second switch;

wherein said magnet induces a magnetization in a magnetic material of the cantilever of the second switch.

49. The system of claim 46, wherein said at least one stepper motor step-wise moves said wafer in the plane of said wafer such that said magnet and said probe card are positioned adjacent to a cantilever corresponding to each switch of the plurality of switches on the wafer, one switch of the plurality of switches at a time.

50. The system of claim 49, wherein said at least one stepper motor moves said wafer in the first direction substantially perpendicular to the plane of said wafer to interface said first set of probes with contact areas of a coil corresponding to a switch of the plurality of switches when positioned adjacently thereto, and to interface said second set of probes with conductors on the wafer for signals associated with the cantilever of the switch of the plurality of switches when positioned adjacently thereto;

wherein said magnet induces a magnetization in a magnetic material of the cantilever corresponding to the switch of the plurality of switches when positioned closely adjacent thereto.

51. The system of claim 44, further comprising:

an inker for marking a switch on the wafer that has been determined by said source monitor unit to be defective.

52. The system of claim 44, further comprising:

a controller electrically coupled to said at least one stepper motor, said current source, and said source monitor unit.

53. The system of claim 44, further comprising:

optics that positions said magnet adjacent to the cantilever of the first switch.

54. The system of claim 44, further comprising at least one additional magnet held in a fixed position relative to said first magnet, wherein said at least one additional magnet is positioned adjacent to at least one additional switch of the plurality of switches;

wherein said probe card further mounts:

at least one additional first set of probes that interfaces with contact areas of at least one additional coil associated with the at least one additional switch on the wafer, and

at least one additional second set of probes that interfaces with conductors on the wafer associated with at least one additional cantilever of the at least one additional switch.